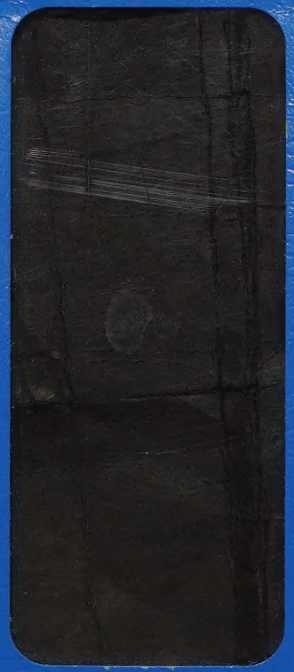

MODEL
429

MAINTENANCE MANUAL

400 Industrial Parkway
Industrial Airport, KS 66031
(913) 764-2452

JcAIR 429
Maintenance Manual

1. GENERAL

This manual includes instructions for operation, calibration and maintenance for the Model 429 Arinc 429 transmitter and receiver.

2. RELATED PUBLICATIONS

Arinc Specification 429-4,5,6,7

REVISIONS HISTORY
JCAIR 429

Page	Rev. No.	Rev. Date	Insertion Date
11	1	02/01/84	
12	1	02/01/84	
12	2	02/06/84	
7	3	10/19/84	
11	3	10/19/84	
12	3	10/19/84	
12	4	06/06/85	

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	C. Digital Board	002-5037-01
	D. Analog Board	002-5037-02

1. Purpose of Manual

This manual provides operational procedures, calibration procedures and maintenance information for the JcAIR Model 429 - Arinc 429 Transmitter and Receiver.

2. User Operating Procedures

A. Installation

Carefully remove the JcAIR 429 and battery charger from the packing box. The batteries were fully charged when the unit was shipped from the factory, however, if the unit has been stored for an extended period of time, the batteries may be discharged. Plug the charger into the jack on the side of the 429 and plug the charger into a 120 vac 60hz outlet. A 4 to 5 hour charge should refresh the batteries.

B. Operation

The JcAIR 429 may be operated while charging or with the charger disconnected. Connect the JcAIR 429 output (Tx Jack) to the 429 input of the UUT and the JcAIR 429 input to the output of the UUT using standard 1/4 inch stereo phone jacks.

1. Turn the unit on by moving the slide switch to the on position.
2. The JcAIR 429 goes through a complete selftest (bite) routine on initial power-up. It begins by checking its own Eprom by summing all its memory locations and comparing the result to the known checksum. If the checksums do not match, the unit signals a checksum error by flashing the even parity LED. (If the entire Eprom has failed, however, or if one of the locations in the checksum test routine is bad, the program will not be able to execute properly and the LCD display will show a random line of characters).

   Once the Eprom has tested OK, the unit does a complete RAM test by writing alternate ones and zeros to each RAM location, then reading the bite back for confirmation. If a RAM error occurs, the JcAIR 429 will respond by blinking the odd parity LED.

   If both RAM amd Eprom test correctly, the unit tests the the LCD display by first sending it a cursor position command, and then reading back and verifying the intended cursor position. A faulty LCD display module will cause the unit to flash the TX display mode LED.

   Finally, the JcAIR 429 tests its internal programmable timer chip by sending it a count-down command and verifying that it times out within the proper period. If the chip has failed, the unit will display the message "BITE FAIL:TIMER" on the LCD display. Otherwise, the test has been success-

fully completed and the unit will display "BITE TEST OK" for approximately two seconds. It will then proceed to the operational receive mode, where the first 429 word that it receives is immediately displayed.

3. The JcAIR 429 displays Arinc 429 Data in four fields:

"Label" Field - Bits 1 through 8 of the 32 Bit 429 Word are displayed in this field as three octal characters (0 through 7). Labels 000 through 377 octal may be displayed in this field.

"SDI" Field - Bits 9 & 10 of the 32 bit word are displayed in both the "SDI" Field and in the "Data" Field. In the SDI Field these bits are displayed in binary format as either a "1" or a "0".

"DATA" Field - Bits 9 through 32 of the 32 bit word are displayed in this field as six hexadecimal characters (0 through F).

"SSM" Field - Bits 30 and 31 are displayed in this field in binary format and are included in the Data Field as well.

"RATE Field" - Displays average word interval in MSEC for the displayed 429 word.

The JcAIR 429 Display is used to display either the transmitted word or received information. LED's at the top of the unit indicate which information is being displayed.

Parity as either odd or even is displayed by the LED pair at the side of the display. When the display is being used for transmitted information, the LED's indicate the transmit word parity. When displaying a received word the LED's indicate the parity of this word.

4. Receive Mode

On initial power-up, after the "BITE TEST" has completed the unit goes into the Receive Mode. If no 429 words are being received, the unit will display "429 RCVR IDLE". Once 429 words are being received, the unit will display the first 429 label that it receives. If more than one label is on the bus, the labels and associated data may be viewed one at a time by pressing the (RX STP) key. Each time this key is pressed, the label being displayed is advanced to the next label on the bus. When the last label is being displayed, pressing the "RX STP" key causes the unit to display the first label.

The number of labels being received may be viewed at any time by pressing the "RX LBL" key.

To look at or for a specific label and SDI expected to be on the bus, the TRAP mode of the JcAIR 429 is used. This mode is activated by pressing the "RX TRP" key. When this key is pressed, a blinking "cursor" is

displayed in the "Label" Field (bits 1-8). Enter the label desired by pressing the appropriate keys and then the "ENT" key. (i.e. Label 210 would be entered by the following key sequence 2-1-0-ENT). The unit now displays XX with the blinking "cursor" in the SDI Field (bits 9-10). Enter the SDI desired followed by "ENT" (10,01,00,11). If a particular SDI is not desired, press the "ENT" key without entering a SDI and the unit will display all SDI's on the bus for the selected label. If the selected label is not on the bus, the unit will display "dashes" in the "DATA" Field and the "SSM" Field.

The "RX SPEED" switch should be set in the HI or LO position depending on which type of bus is being monitored.

The average rate (interval) the selected word is being received on the bus is displayed in milliseconds. The RATE Field is selected using the "Display" ("RATE/DATA") switch.

The display is transfered to receive mode by pressing any of the receive keys ("RX TRP", "RX LBL", "RX STP").

5. TRANSMIT MODE

The display is transfered to transmit mode by pressing one of the transmit keys ("TX LBL", "TX DAT", "TX RAT"). When one of these keys is depressed, the unit is set up for data entry into the appropriate field. To maintain the information being transmitted without change, press the "ENT" key.

Pressing "TX LBL" key causes a blinking cursor to appear in the "Label" field. The desired label is entered by pressing the keys in sequence followed by "ENT". Leading zeros need not be entered. (i.e. Label 021 is entered by the following key sequence: 2-1-ENT). Entering label "0" turns the transmitter OFF. The label field will accept labels from 0 to 377 octal. Labels which exceed 377 are not valid, and the unit will disallow their entry. Keys not in the octal range (0 through 7) are not allowed.

Pressing "TX DAT" key causes a blinking cursor to appear in the "DATA" field. The desired Data is entered in hexadecimal by pressing the proper keys followed by "ENT". When the data in entered, the SDI (bits 9 & 10) and the SSM (bits 30 & 31) are displayed in binary format in the SDI and SSM fields as well as in the DATA field.

The parity bit (bit 32) is automatically changed from a "1" to an "0" depending on the data and on the position of the TX parity switch (EVEN/ODD).

Pressing "TX RAT" key causes a blinking cursor to appear in the RATE field. The rate of transmission desired for the transmitted word is set by entering the desired

period in milliseconds. Intervals between 5 milliseconds and 4094 milliseconds are allowed. When the rate is entered, the display will revert to the "SDI", "DATA", and "SSM" fields if the "display" switch is in the "DATA" position.

The "TX SPEED" switch should be set in the HI or LO position depending on the transmit speed required by the 429 word.

3. Calibration Procedures

A. Specifications

a. JcAIR 429 size 4.7" wide x 7.4" long x 2.25" high
weight 3 lbs.

b. Transmitter format arrive 429 rz 32 bit word
Bit Rate - 12.5 kbps ± .01% low speed
100 kbps ± .01% high speed
Pulse Rise Time - 10 usec ± 5 usec low speed
1.5 usec ± .5 usec high speed
Pulse Amplitude - 10 volt ± 1.0 volt "1" (between A & B)
10 volt ± 1.0 volt "0" (between A & B)
Output Impedance - 75± 5 ohms (between A & B)
Word Rate - 5 to 1999 msec (interval)
Parity - odd or even

c. Receiver
Bit Rate - 8 to 20 kbps (low speed)
80 to 125 kbps (high speed)
Word Rate ± 1 msec average

JcAIR INSTRUMENTATION
Model "429"

001-0001-00
REV 3

SYM	P/N	DESCRIPTION	QTY
Ref	002-0001-00	Schematic	Ref
Ref	300-0001-00	Assy, JcAir 429	Ref
Ref	001-0001-00	Bill of Mat, JcAir 429	x
1	200-5037-00	Assy, Display Bd.	1
2	200-5037-01	Assy, Digital Bd.	1
3	200-5037-02	Assy, Analog Bd.	1
4	047-0035-00	Cover	1
5	047-0036-00	Chassis	1
6	047-0038-00	Bracket, Battery	1
7	092-5102-04	Rivet	2
8	090-0003-00	Battery holder	1
9	015-0001-00	Battery AA, Nicad	6
10	030-0021-00	Phone Jack 12B	2
11	030-0024-00	Phone Jack 43A	1
12	089-8001-08	Standoff 4-40 x 5/8	4
13	089-8101-00	Standoff 4-40 x 1/8	4
14	089-8001-10	Standoff 4-40 x 3/4	4
15	025-0001-05	Ribbon cable, 50	10"
16	030-0026-00	Socket 50 Pin Ribbon	2
17	025-0001-00	Ribbon cable, 14	4"
18	030-0027-00	Plug, 14 Pin Dip Ribbon	2
19	089-2004-04	Screw PHP 4-40 x 1/4	4
20	089-2020-04	Screw FHP 4-40 x 1/4	4
21	057-0001-00	S/N Tag	1
22	057-5001-00	Label, Display	1
23	090-0003-00	Rubber Feet	4

JcAIR INSTRUMENTATION
Model "429"

200-5037-00
REV 2

SYM	P/N	DESCRIPTION	QTY
Ref	002-5037-00	Schematic	Ref
Ref	300-5037-00	Assy, Display Bd.	Ref
Ref	200-5037-00	Bill of Mat, Display Bd.	x
1	009-5037-00	P.C. Bd., Display Bd.	1
2	089-2004-04	Screw PHP 4-40 x 1/4	2
3	037-0001-00	Display	1
4	030-0019-00	Header, 50 Pin	1
5	030-5002-00	Socket	13
C1	095-0001-06	Cap AL/EL 1.0 uf	4
C2	095-0001-06	Cap AL/EL 1.0 uf	-
C3	095-0001-06	Cap AL/EL 1.0 uf	-
C4	095-0001-06	Cap AL/EL 1.0 uf	-
C5	109-0000-01	Cap M/C 0.1 uf	1
C6	109-0001-33	Cap D/C .001 uf	1
CR1	007-8003-00	Led, Red	4
CR2	007-8003-00	Led, Red	-
CR3	007-8003-00	Led, Red	-
CR4	007-8003-00	Led, red	-
Q1	007-5000-00	Transistor 2N2222	1
R1	130-0102-23	Res 1000 ohms 1/4 w 5%	4
R2	130-0102-23	Res 1000 ohms 1/4 w 5%	-
R3	130-0102-23	Res 1000 ohms 1/4 w 5%	-
R4	130-0102-23	Res 1000 ohms 1/4 w 5%	-
R5	130-0474-23	Res 470K ohms 1/4 w 5%	2
R6	130-0474-23	Res 470K ohms 1/4 w 5%	-
R7	130-0333-23	Res 33K ohms 1/4 w 5%	1
R8	130-0334-23	Res 330K ohms 1/4 w 5%	1
R9	130-0223-23	Res 22K ohms 1/4 w 5%	1
S1	031-3001-00	Switch, Slide SPST	5
S2	031-3001-00	Switch, Slide SPST	-
S3	031-3001-00	Switch, Slide SPST	-
S4	031-3001-00	Switch, Slide SPST	-
S5	031-3001-00	Switch, Slide SPST	-
S6	031-5001-00	Switch, Push Button, SPST	23
S7	031-5001-00	Switch, Push Button, SPST	-
S8	031-5001-00	Switch, Push Button, SPST	-
S9	031-5001-00	Switch, Push Button, SPST	-
S10	031-5001-00	Switch, Push Button, SPST	-
S11	031-5001-00	Switch, Push Button, SPST	-
S12	031-5001-00	Switch, Push Button, SPST	-
S13	031-5001-00	Switch, Push Button, SPST	-
S14	031-5001-00	Switch, Push Button, SPST	-
S15	031-5001-00	Switch, Push Button, SPST	-
S16	031-5001-00	Switch, Push Button, SPST	-
S17	031-5001-00	Switch, Push Button, SPST	-
S18	031-5001-00	Switch, Push Button, SPST	-
S19	031-5001-00	Switch, Push Button, SPST	-
S20	031-5001-00	Switch, Push Button, SPST	-
S21	031-5001-00	Switch, Push Button, SPST	-

JcAIR INSTRUMENTATION
Model "429"

200-5037-00
REV 2

SYM	P/N	DESCRIPTION	QTY
S22	031-5001-00	Switch, Push Button, SPST	-
S23	031-5001-00	Switch, Push Button, SPST	-
S24	031-5001-00	Switch, Push Button, SPST	-
S25	031-5001-00	Switch, Push Button, SPST	-
S26	031-5001-00	Switch, Push Button, SPST	-
S27	031-5001-00	Switch, Push Button, SPST	-
S28	031-5001-00	Switch, Push Button, SPST	-
U1	120-4922-03	I.C. 74C922	2
U2	120-4922-03	I.C. 74C922	-
U3	120-4374-03	I.C. 74C374	2
U4	120-4374-03	I.C. 74C374	-
U5	120-4373-03	I.C. 74C373	1

200-5037-01
REV 2

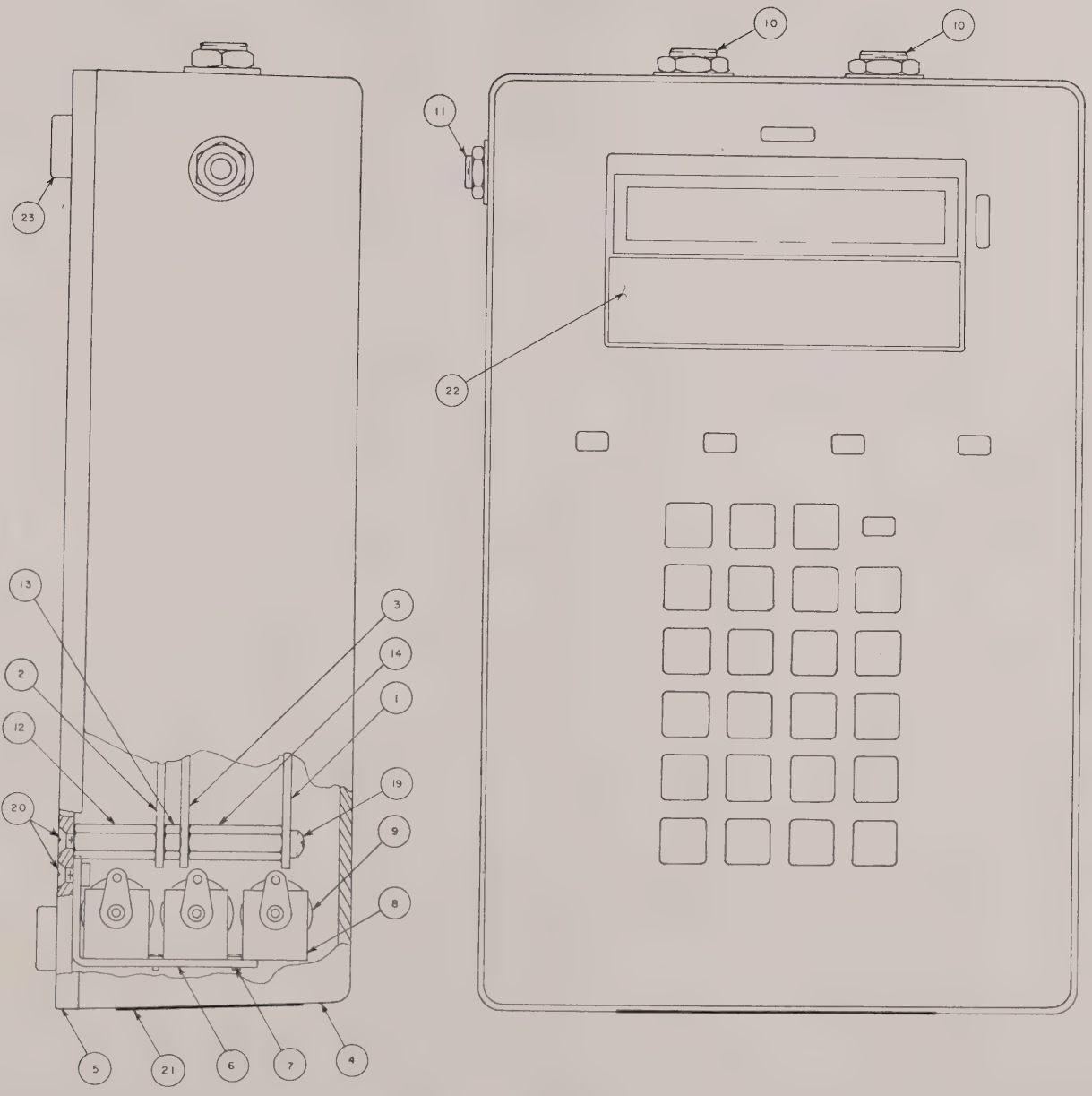
SYM	P/N	DESCRIPTION	QTY
Ref	002-5037-01	Schematic	Ref
Ref	300-5037-01	Assy, Digital Bd.	Ref
Ref	200-5037-01	Bill of Mat, Digital Bd.	x
1	009-5037-01	P.C. Board, Digital	1
2	030-0025-00	Header, Rt Angle 50 Pin	1
3	030-5001-00	Socket, 14 Pin Dip	1
C1	109-0001-09	Cap D/C 33 pf	1
C2	109-0001-10	Cap D/C 39 pf	1
C3	095-0001-00	Cap AL/EL 10 uf	1
R1	130-0105-23	Res 1 Meg 1/4w 5%	1
R2	130-0101-23	Res 100 ohms 1/4w 5%	1
R3	130-0563-23	Res 56K ohms 1/4w 5%	1
U1	120-4138-05	I.C. 74HC138	1
U2	120-8003-00	I.C. NMC 6514-5N	2
U3	120-8003-00	I.C. NMC 6514-5N	-
U4	120-8002-00	I.C. 65SC05 AP-1	1
U5	120-8004-00	I.C. 27C32-55	1
U6	120-4373-05	I.C. 74HC373	1
U7	120-8001-00	I.C. CDP 1878	1
U8	120-0094-00	I.C. 4094	1
U9	120-0081-00	I.C. 4081	2
U10	120-0069-00	I.C. 4069	1
U11	120-0013-00	I.C. 4013	2
U12	120-0081-00	I.C. 4081	-
U13	120-0013-00	I.C. 4013	-
U14	120-0520-00	I.C. 4520	1
U15	120-0071-00	I.C. 4071	1
Y1	044-0001-00	Crystal 2MHZ	1

JcAIR INSTRUMENTATION
Model "429"

200-5037-02
REV 4

SYM	P/N	DESCRIPTION	QTY
Ref	002-5037-02	Schematic	Ref
Ref	300-5037-02	Assy, Analog Bd.	Ref
Ref	200-5037-02	Bill of Mat, Analog Bd.	x
1	009-5037-02	P.C. Bd, Analog	1
2	030-5001-00	Socket, 14 Pin Dip	1
C1	109-0001-27	Cap D/C 470 pf	4
C2	109-0001-27	Cap D/C 470 pf	-
C3	109-0002-00	M/M D/C 470 0.01	1
C4	109-0001-39	Cap D/C 4700 pf	2
C5	109-0001-39	Cap D/C 4700 pf	-
C6	109-0001-16	Cap D/C 100 pf	4
C7	109-0001-11	Cap D/C 47 pf	3
C8	109-0001-16	Cap D/C 100 pf	-
C9	109-0001-01	Cap D/C 10 pf	2
C10	109-0000-01	Cap M/C 0.1 uf	8
C11	109-0000-01	Cap M/C 0.1 uf	-
C12	109-0001-27	Cap D/C 470 pf	-
C13	109-0001-16	Cap D/C 100 pf	-
C14	109-0001-11	Cap D/C 47 pf	-
C15	109-0001-16	Cap D/C 100 pf	-
C16	109-0001-01	Cap D/C 10 pf	-
C17	109-0000-01	Cap M/C 0.1 uf	-
C18	109-0000-01	Cap M/C 0.1 uf	-
C19	109-0001-27	Cap D/C 470 pf	-
C20	109-0000-01	Cap M/C 0.1 uf	-
C21	109-0000-01	Cap M/C 0.1 uf	-
C22	109-0000-01	Cap M/C 0.1 uf	-
C23	109-0001-11	Cap D/C 47 pf	-
C24	095-0001-02	Cap AL/EL 100 uf	1
C25	109-0000-01	Cap M/C 0.1 uf	-
C26	095-0001-00	Cap AL/EL 10 uf	2
C27	095-0001-00	Cap AL/EL 10 uf	-
CR1	007-0001-00	Diode 1N4154	3
CR2	007-0001-00	Diode 1N4154	-
CR3	007-0001-00	Diode 1N4154	-
CR4	007-1001-00	Diode 8.2V Zener	1
CR5	007-0013-00	Diode 1N5817	1
R1	130-0472-23	Res 4700 ohms 1/4w 5%	4
R2	130-0472-23	Res 4700 ohms 1/4w 5%	-
R3	130-0562-23	Res 5600 ohms 1/4w 5%	4
R4	130-0562-23	Res 5600 ohms 1/4w 5%	-
R5	130-0102-23	Res 1000 ohms 1/4w 5%	6
R6	130-0471-23	Res 470 ohms 1/4w 5%	2
R7	130-0472-23	Res 4700 ohms 1/4w 5%	-
R8	130-0472-23	Res 4700 ohms 1/4w 5%	-
R9	130-0562-23	Res 5600 ohms 1/4w 5%	-

R10	130-0562-23	Res 5600 ohms 1/4w 5%	-
R11	130-0102-23	Res 1000 ohms 1/4w 5%	-
R12	130-0471-23	Res 470 ohms 1/4w 5%	-
R13	130-0560-23	Res 56 ohms 1/4w 5%	2
R14	130-0390-23	Res 39 ohms 1/4w 5%	2
R15	130-0390-23	Res 39 ohms 1/4w 5%	-
R16	130-0560-23	Res 56 ohms 1/4w 5%	-
R17	130-0103-23	Res 10K ohms 1/4w 5%	2
R18	130-0120-23	Res 12 ohms 1/4w 5%	2
R19	130-0563-23	Res 56K ohms 1/4w 5%	2
R20	130-0183-23	Res 18K ohms 1/4w 5%	2
R21	130-0102-23	Res 1000 ohms 1/4w 5%	-
R22	130-0102-23	Res 1000 ohms 1/4w 5%	-
R23	130-0103-23	Res 10K ohms 1/4w 5%	-
R24	130-0563-23	Res 56K ohms 1/4w 5%	-
R25	130-0120-23	Res 12 ohms 1/4w 5%	-
R26	130-0102-23	Res 1000 ohms 1/4w 5%	-
R27	130-0102-23	Res 1000 ohms 1/4w 5%	-
R28	130-0183-23	Res 18K ohms 1/4w 5%	-
R29	130-0123-23	Res 12K ohms 1/4w 5%	2
R30	130-0681-23	Res 680 ohms 1/4w 5%	3
R31	130-0123-23	Res 12K ohms 1/4w 5%	-
R32	130-0681-23	Res 680 ohms 1/4w 5%	-
R33	130-0027-23	Res 2.7 ohms 1/4w 5%	1
R34	130-0220-23	Res 22 ohms 1/4w 5%	1
R35	130-0681-23	Res 680 ohms 1/4w 5%	-
R36	130-0047-23	Res 4.7 ohms 1/4w 5%	1
R37	136-4993-12	Res 499K ohms 1/8w 1%	1
R38	130-0106-23	Res 10 Meg ohms 1/4w 5%	1
R39	136-1823-12	Res 18.2K ohms 1/8w 1%	1
R40	130-0150-23	Res 15 ohms 1/4w 5%	1
Q1	007-5000-00	2N2222	2
Q2	007-5001-00	2N2907	3
Q3	007-5000-00	2N2222	-
Q4	007-5001-00	2N2907	-
Q5	007-5001-00	2N2907	-
U1	120-0016-00	I.C. 4016	1
U2	120-3034-00	I.C. CA 3130	2
U3	120-3034-00	I.C. CA 3130	-
U4	120-3032-00	I.C. LM393	1
U5	120-3033-00	I.C. LM2931 T-5.0	1
U6	120-3035-00	I.C. ICL 7660	1
U7	120-3031-00	I.C. LM10	1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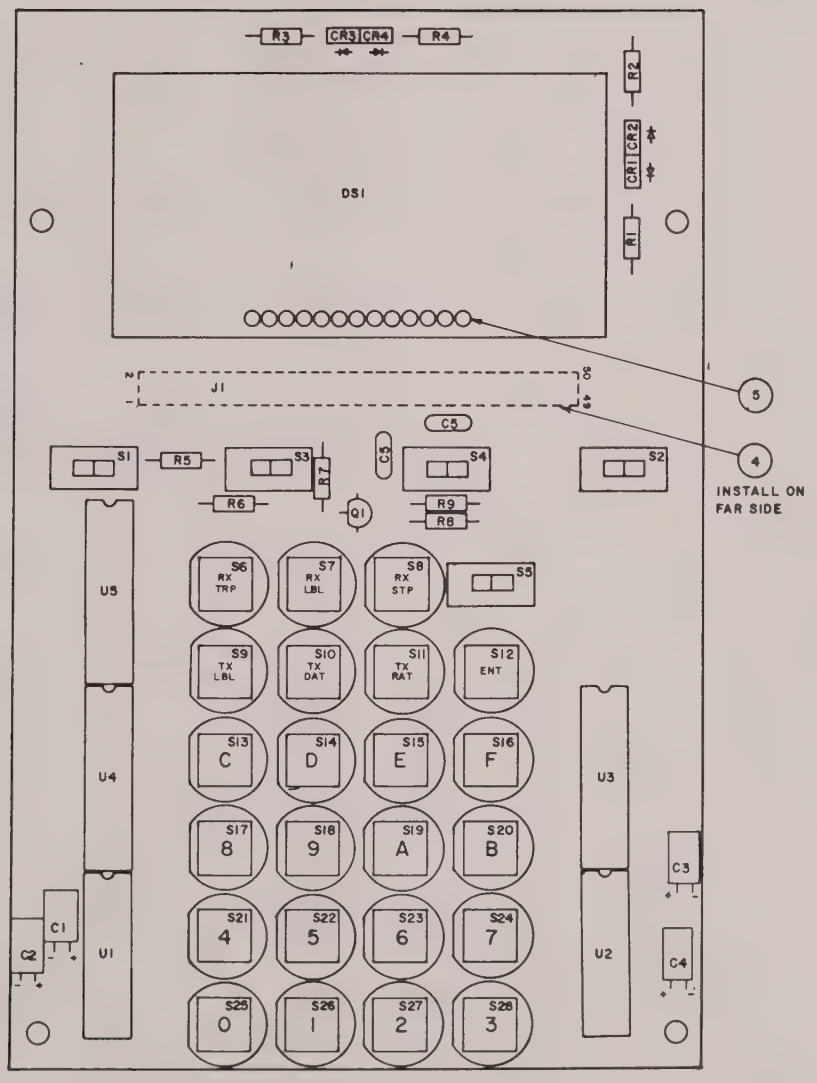
R3
CR3
CR4
R4
R2
CR1
CR2
R1
DS1
J1
5
4
INSTALL ON
FAR SIDE
C5
C6
S1
R5
S3
R7
S4
S2
R6
Q1
R9
R8
S5
U5
S6
RX
TRP
S7
RX
LBL
S8
RX
STP
S9
TX
LBL
S10
TX
DAT
S11
TX
RAT
S12
ENT
U4
S13
C
S14
D
S15
E
S16
F
U3
S17
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S18
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S19
A
S20
B
C3
C1
Q2
U1
S21
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S25
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S26
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S27
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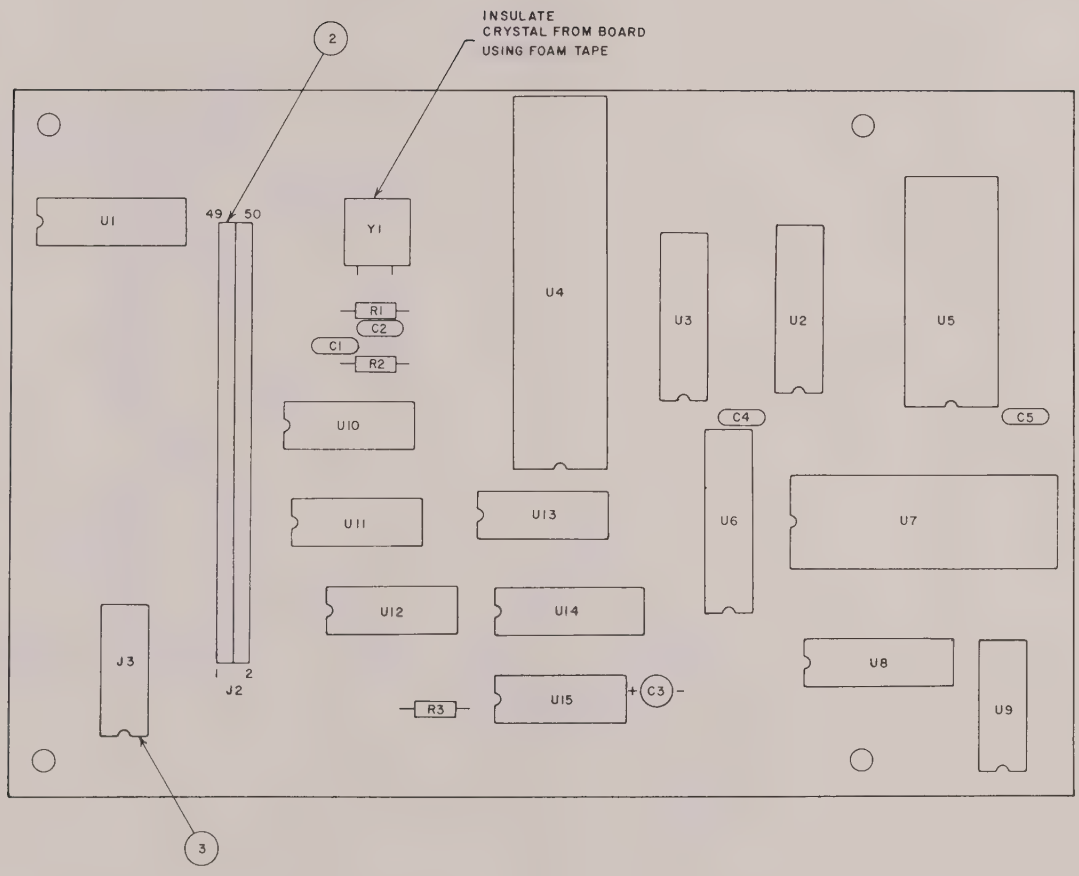
S28
3


INSULATE
CRYSTAL FROM BOARD
USING FOAM TAPE
2
3
U1
49
50
J2
1
2
J3
Y1
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C2
C1
R2
U10
U11
U12
U13
U14
U15
R3
C3
U4
U3
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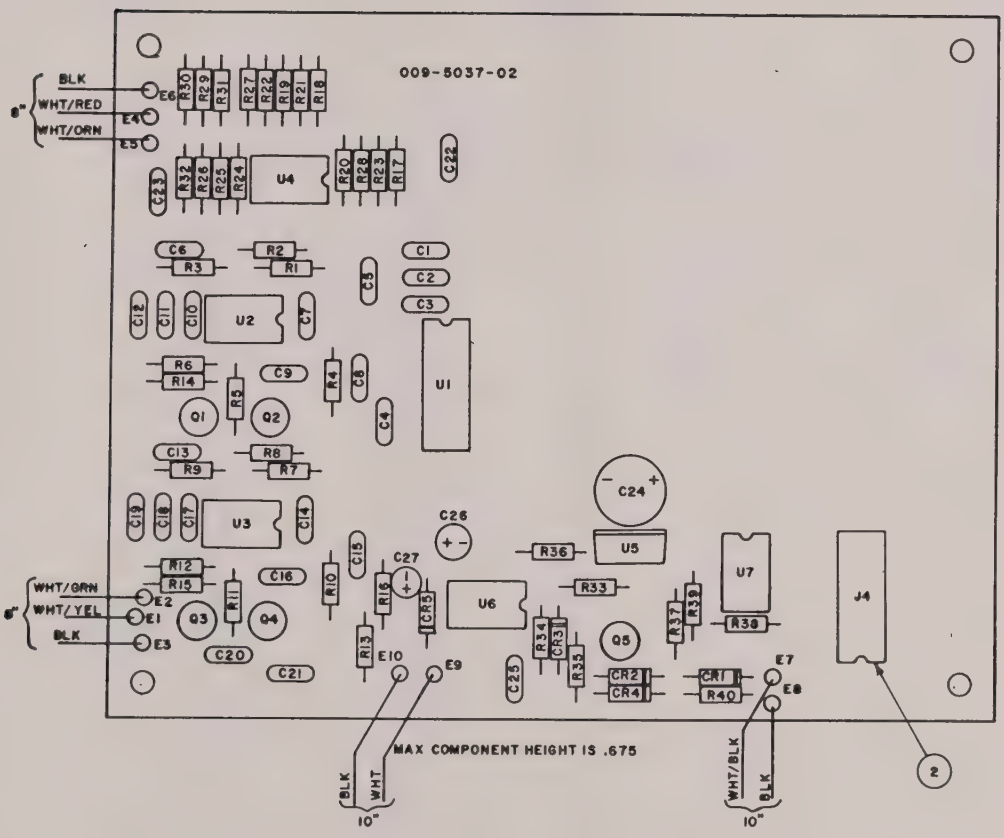
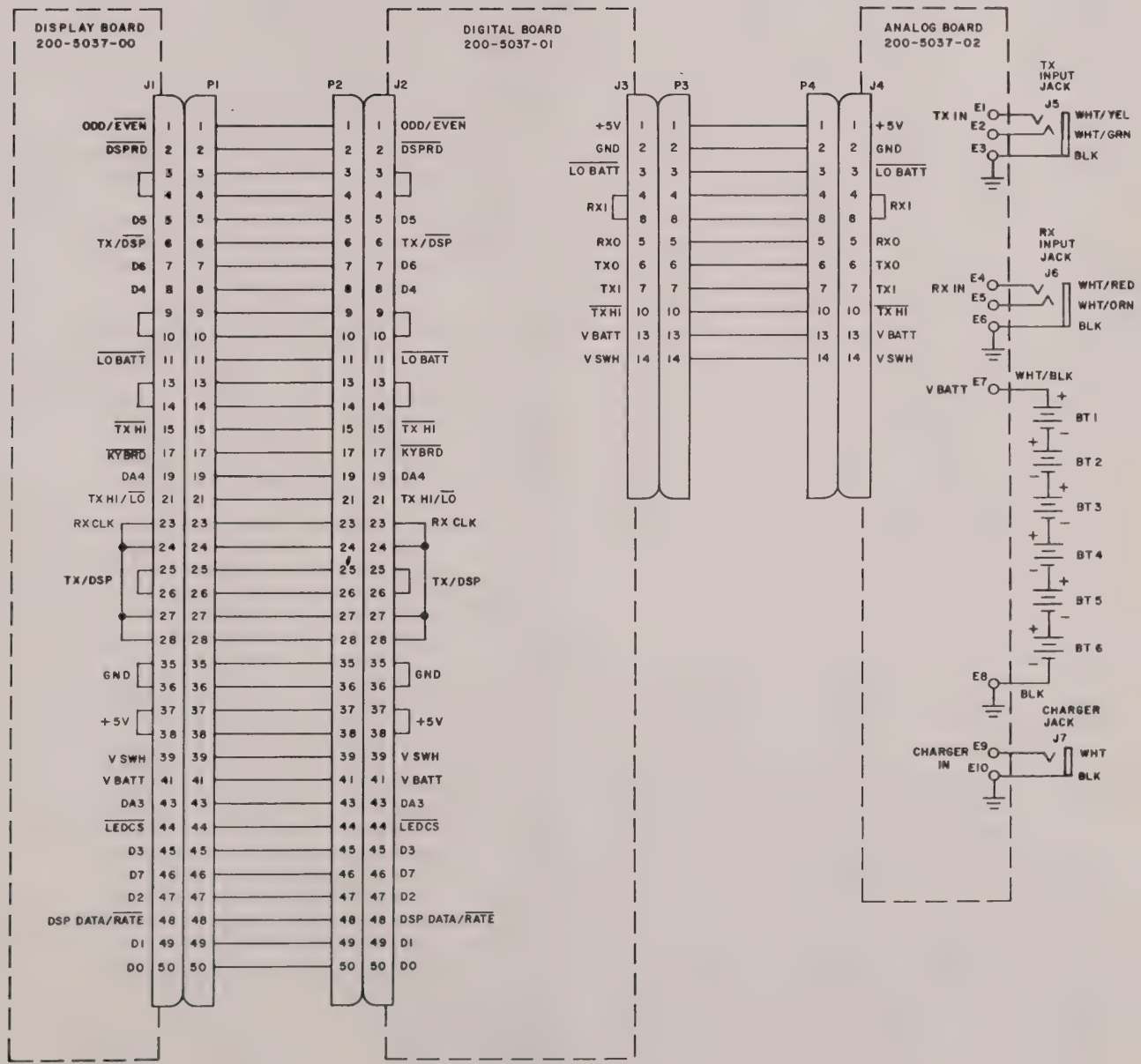
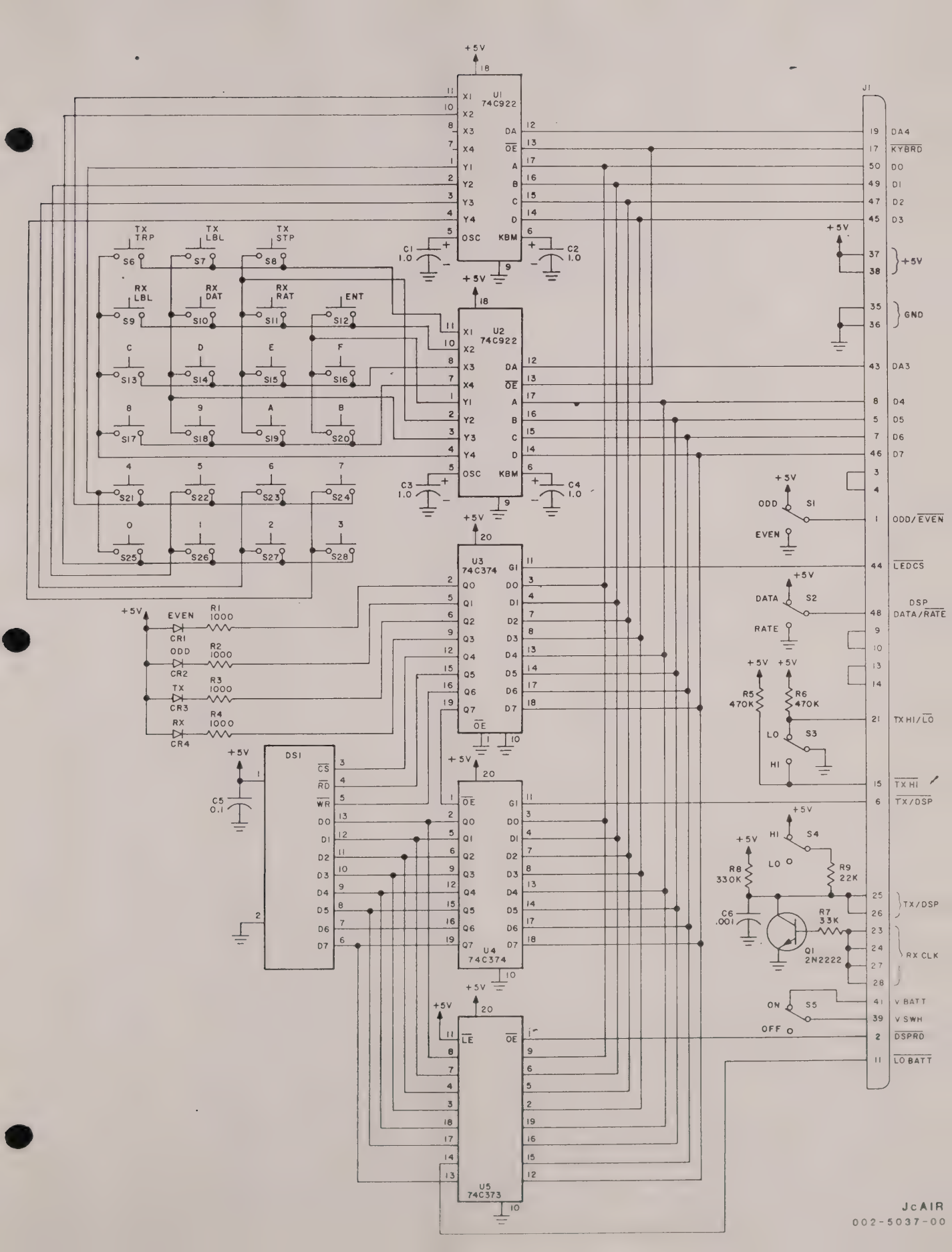
C4
C5
U6
U7
U8
U9


009-5037-02
BLK
WHT/RED
WHT/ORN
8"
E6
E4
E5
R30
R29
R31
R27
R22
R19
R21
R18
U4
R32
R26
R25
R24
R20
R28
R23
R17
C22
C23
C6
R3
R2
R1
C1
C2
C3
C5
C12
C11
C10
U2
C7
U1
R6
R14
C9
R4
C8
C4
Q1
R5
Q2
C13
R9
R8
R7
C19
C18
C17
U3
C14
C26
C24
R36
U5
U7
J4
R12
R15
C16
C15
R10
C27
R16
CR5
U6
R33
R38
WHT/GRN
WHT/YEL
BLK
8"
E2
E1
E3
Q3
R11
Q4
C20
C21
R13
E10
E9
R34
CR3
R35
Q5
R37
R39
C25
CR2
CR4
CR1
R40
E7
E8
MAX COMPONENT HEIGHT IS .675
BLK
WHT
10"
WHT/BLK
BLK
10"
2


DISPLAY BOARD
200-5037-00
DIGITAL BOARD
200-5037-01
ANALOG BOARD
200-5037-02
J1
P1
P2
J2
J3
P3
P4
J4
ODD/EVEN
DSPRD
D5
TX/DSP
D6
D4
LO BATT
TX HI
KYBRD
DA4
TX HI/LO
RX CLK
TX/DSP
GND
+5V
V SWH
V BATT
DA3
LEDCS
D3
D7
D2
DSP DATA/RATE
D1
D0
RX1
RXO
TXO
TXI
TX HI
V BATT
V SWH
TX INPUT JACK
J5
TX IN
E1
E2
E3
WHT/YEL
WHT/GRN
BLK
RX INPUT JACK
J6
RX IN
E4
E5
E6
WHT/RED
WHT/ORN
BLK
E7
WHT/BLK
BT1
BT2
BT3
BT4
BT5
BT6
E8
BLK
CHARGER JACK
J7
CHARGER IN
E9
E10
WHT
BLK



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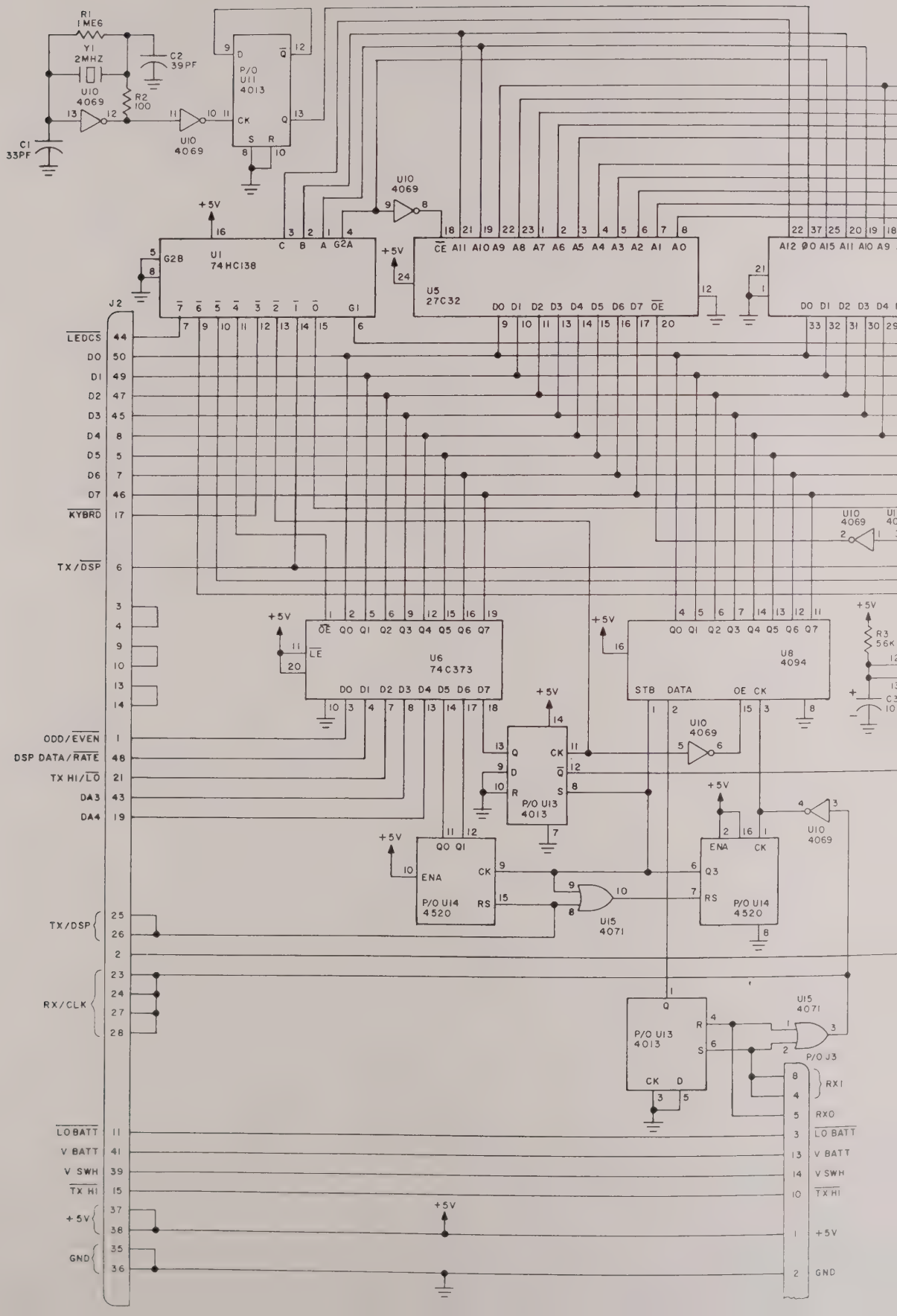
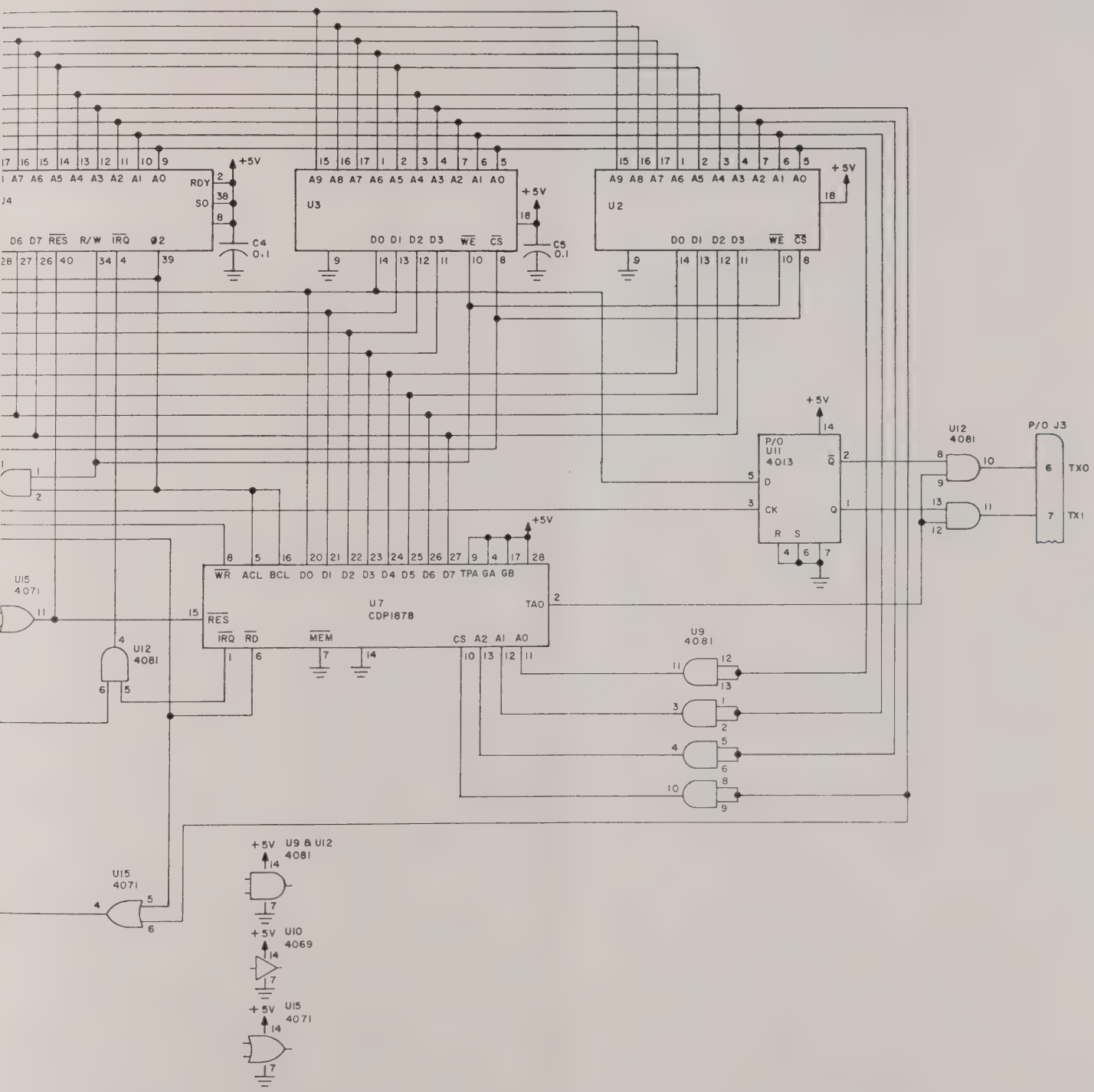

R1 1MEG
Y1 2MHZ
C2 39PF
U10 4069
R2 100
C1 33PF
P/O U11 4013
U1 74HC138
U5 27C32
U6 74C373
U8 4094
P/O U13 4013
P/O U14 4520
U15 4071
R3 56K
J2
LEDCS
DO
D1
D2
D3
D4
D5
D6
D7
KYBRD
TX/DSP
ODD/EVEN
DSP DATA/RATE
TX HI/LO
DA3
DA4
RX/CLK
LO BATT
V BATT
V SWH
TX HI
+5V
GND
P/O J3
RX1
RX0



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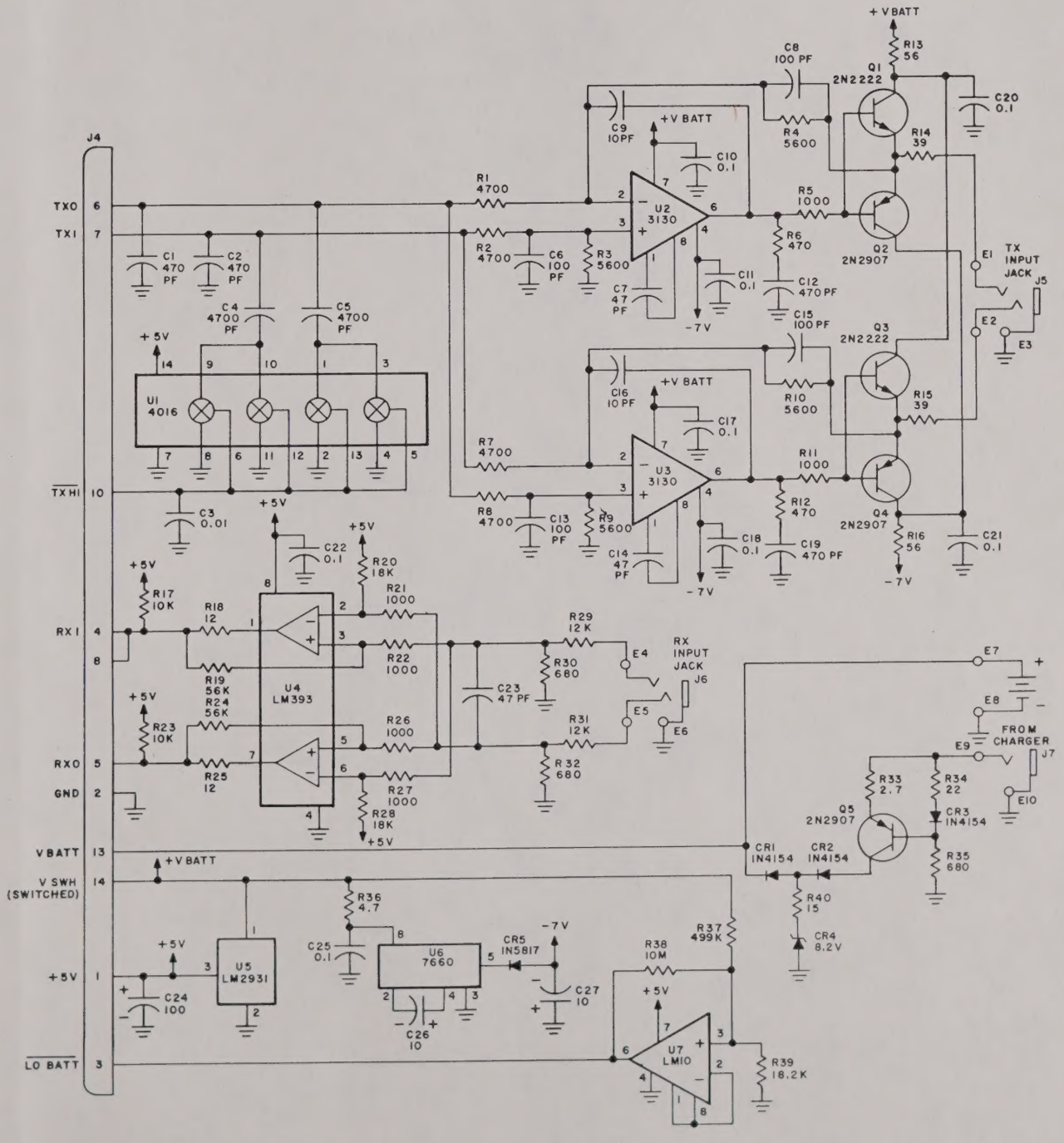

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SMEAD—HASTINGS, MFR.
NO. 1208E